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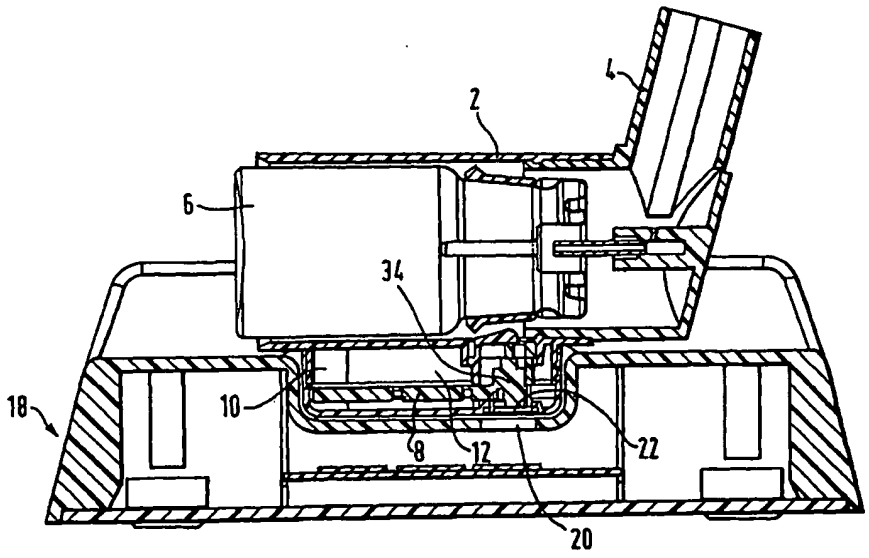

(57) Abstract: A utilitarian device is disclosed comprising a body (2) in which are incorporated electronic circuitry and a power storage component (10) therefor. The circuitry includes an electronic memory (24), and provision is made for adding information to that memory (24) as the device is used. An induction generator (12) can also be incorporated in the body (2) to sustain the power storage component (10). Information can be added to the memory (10) at any stage from manufacture of the device to and during its ultimate use, thereby creating an effective history of the device in the memory (24). A particular embodiment of the invention is an inhaler in which the ultimate user can keep an effective record of activity.

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UTILITARIAN MEMORY DEVICES

This invention relates to utilitarian devices in which information can be stored, and in which such information can be varied. It has application in storing medical dosages where the use or consumption of those dosages must be monitored. A particular application is in inhalers whose overuse can be damaging to the user's health.

According to the invention, a utilitarian device comprises a body having incorporated therein electronic circuitry and a power storage component therefor. The circuitry includes an electronic memory, and means are provided for adding information to the memory as the product is used. These means would normally deliver an electronic signal to the circuitry which is recorded in the memory, and the device may include a mechanism for generating such an electrical signal in response to use of the product. The mechanism is typically a piezoelectric device or a microswitch, and may be operated manually by a user each time the device is used. Alternatively, the mechanism can be installed in the device in such a manner that it is activated automatically when the device is used. A piezoelectric crystal or a proximity detector for example, disposed behind a membrane at a surface of the body, can be very sensitive to changes at the surface. Located in the wall of a duct, such a device can monitor the passage of material along the duct, while itself being fully protected.

The power storage component in a product of the invention is typically a rechargeable battery or capacitor. Recharging can be conducted via external connectors, but it is preferred to include in the device an induction generator for sustaining the power storage component for the circuitry, the generator having elements movable relative to one another such that movement of the container provokes such relative movement. Solar cells can also be used.

The electronic memory can be used to retain a wide range of information relating to use of the device. Where the device is a container, basic information would of course be the amount of product remaining in the container, but it can also keep a record of the number of times it has been used, when it was last used, and when it should next be used. This is particularly valuable when medicine is required to be taken at regular intervals or according to a predetermined timetable. In such circumstances by keeping a record of when the container has been used, the memory can provide an indication of whether the user has adhered to such a predetermined timetable. A visual display coupled to the electronic circuitry can be provided on the container to show some or all of this kind of information. The container can though, include means for coupling the circuitry to a separate unit through a docking station in which information stored in the memory can be received, analysed or displayed. In this way, access to information in the memory can be controlled or restricted.

Devices of the invention can be designed simultaneously with a stand or docking station to which they can be connected for the transfer of data, to and from the device and/or the transfer of power to the device or a battery therein. This can be particularly valuable when a device is to be re-used. It can be installed on a stand or docking station, stripped of data, and reloaded with new data for an entirely different regime. The removed data can of course be retained, in the base or other equipment connected thereto for storage and/or analysis. The base or docking station can be designed with a mechanism that is uniquely able to activate the circuitry in the device to release data stored and accumulated therein for transfer to external equipment. Stands for the end users of devices according to the invention would of course only perform some of these functions. Stripping the memory of data and reprogramming will normally only be conducted by the manufacturer when a device is being recycled.

Access to information in the memory can be had in a number of ways. Typically, the device can include a visual display which can show some or all of the information in the memory and typically, such a display will comprise an electroluminescent material disposed behind a window in a wall of the housing. Access can also be had to information in the memory through an infrared or radio frequency window in the wall of the container, and such a window can also be used to deliver data and/or power to the circuitry and/or storage component. By this means, or by the use of other forms of connection, the circuitry and more particularly the memory can be programmed with information relating to the use of the medicinal product. Such information can be used to protect against over-use of the device. For example, it can generate a warning signal if the container is sought to be used too soon after a previous use.

It will be appreciated from the above that the invention can readily be applied to a dispensing device in which a mechanism is included for generating a signal each time product is removed. The mechanism then transmits that signal to the memory where that piece of data is retained. This aspect of the invention can be embodied in an inhaler in which a dosage is taken when required, rather than at regular intervals. In such a device it is important not only to know how many dosages have been used, and how many remain, but also how long it is since a supply of inhalant was first accessed. In this application then, memory can store information relating to the first use and, as appropriate, the time at which each subsequent dosage was taken. In this way, means are provided for at least putting an operator on notice if the device is being over-used. These same features can, of course, be incorporated in any device according to the invention as part of the means by which the usage of the device is monitored. In the application of the present invention to an inhaler, the sensing mechanism is fitted in the inhaler mouthpiece to sense the passage of inhalant therethrough. The mechanism

might be a pressure sensor, but a preferred mechanism comprises cross wires traversing the mouthpiece which can not only sense the passage of inhalant, but also give an indication of its quality. Particularly, cross wires can be used to provide an indication of the proportion of carrier and active ingredient in the suspension which is drawn through the mouthpiece.

Portable devices are of course subject to movement as they are carried around, and an induction generator of the kind referred to above will thus generate power by this normal movement. However, it is generally recommended that inhalers particularly are deliberately shaken before use to ensure uniform distribution of carrier and active ingredient in the inhalant, and this can ensure the generation of sufficient power to record relevant data from the subsequent use.

In one of its more simple forms, a device according to the invention can be a disposable unit. Such a unit could have a battery and relatively simple circuitry that would be sufficient for an inhaler of the kind described above. Devices for monitoring less straightforward treatment regimes can include more complex circuitry with memories storing more detailed information. Such devices would normally be reusable, with either a rechargeable component or a solar cell as the power source and/or have means for coupling to an external power source or other equipment.

The invention does of course have application in fields other than the monitoring of medical dosages. A wide range of goods may be packaged in products according to the invention, and a wide range of information can be stored in the memory. Thus, the quality of an item in the product can be monitored, as can any changes in the product contents. Chemical reactions and temperatures can be monitored, and by coupling the memory to external equipment, the contents of the product can be subject to treatment in response to information derived from the memory.

For comestible products particularly, it is important to know their age, and the "use by" date, after which their consumption could have undesirable consequences. The same applies to pharmaceutical products and medicines, particularly OTC products manufactured and packaged well prior to their expected sale and use date. For some such goods, this information is not as accurate or comprehensive as it might be hoped to be as, particularly for packaged products, the history of each individual product in the package may not be the same.

The present invention can be used to keep a record of a product's history from a chosen stage. Typically, a device of the invention can be applied at a specific point in the manufacture of the product, with the initial data entered in the device being of course directly related to that particular stage. As the product moves through subsequent stages additional information will be entered. The memory device would be accessible, with the ease of access being dependent of course upon the confidentiality of any data in the device, but the stored information would provide a history of the product, and thus important information for a subsequent user.

In a relatively straightforward application of the above, such as to fresh food for retail sale, a tag or packaging can include a memory device of the invention, into which the information critical to its safe consumption has been programmed. For example, it can contain a record of when a piece of fruit was picked, and in what state; ie ripe, or green and still to be ripened, and subsequent dates identifying when a product should go on sale and critically of course, when it should be withdrawn from sale after too long on the shelves. In a more complex application, a device of the invention can be applied to a factory product at the early stage in its manufacture, and record subsequent stages in its manufacture together with relevant details of its components. With all this information accessible later in the product's life, in

the event that a difficulty arises with it diagnosis of that difficulty and selection of a means by which the difficulty can be met will be greatly facilitated.

The invention can also be used in connection with packaged products. The memory device being applied to the package rather than the individual products. The device can though, be programmed with information specific to each product in the package, and if there are different criteria that apply to different products within the package, this information can be made available.

The invention has particular application to manufactured products. According to this aspect of the invention, such a product incorporates electronic circuitry forming an accessible memory programmed with data comprising details of its manufacture, and adapted to receive additional data relating to its subsequent history. That additional data can be user instructions and/or data relating to the eventual use of the product. The means by which data relating to the eventual use of the product is entered into the memory can be automatic. In other words, the product can include some mechanism by which the history of a product's use is recorded of the kind referred to above. In this way, the product itself can keep a record of its use and more importantly perhaps, of any misuse. In the subsequent analysis of the effectiveness of a product, its use or misuse according to given instructions is of course important.

Where the accessible memory in a device according to the invention holds data relating to quite different aspects of a product, the memory can also be programmed with different levels of access. An eventual user would of course need access to user instructions, and possible data relating to the eventual use or misuse of the product according to such instructions. A supplier would certainly wish to have access to the user instructions and eventual use data in the event of a product provoking a complaint. The manufacturer will of course wish to have access to all data held in the memory

for guidance regarding future manufacturing practices. Particularly, the manufacturer will wish to monitor not only the performance of a product, but also the manner in which the performance varies in response to different user instructions and different levels of misuse of the product.

The above classes of data entered on the memory in products according to the invention and their accessibility is particularly relevant to medical and pharmaceutical products; either prescribed or OTC products. Instructions given by doctors and pharmacists for example regarding the use of such products can vary according to the symptoms described, and by accessing the entire data in the memory, when a used product is returned, the manufacturer can modify the product and/or vary the basic guidelines regarding its use. It will be appreciated that where appropriate doctors, pharmacists and other retailers of such products can be enabled to program use instructions into a product for a particular patient or customer.

Devices of the invention can also be used to record information sensed rather than that which has been deliberately programmed into it. For example, if a product is to be stored in particular conditions such as temperature and humidity, then the memory device applied to it can include appropriate sensors that in effect notify the device if the relevant ambient condition goes beyond a predetermined limit. This information can then be made available to a subsequent handler of the product, who then has the option of making a judgement as to whether the product can be used. This feature does of course apply particularly to pharmaceuticals and medicines, but it can also be of value in the context of factory products which may use for example, a temperature sensitive component.

It will be appreciated from the above that accessible memories can be applied to and sometimes implanted in manufactured products or their packaging in accordance with the invention to provide a history of that product

over whatever period is chosen. For example, the memory in a pharmaceutical device can be programmed with basic manufacturing data, distribution details, user instructions and eventual use data, at different stages. If the product is in due course returned to the manufacturer, it will bear a comprehensive history which will be of considerable value in subsequent product development. The memory circuitry can be formed integrally with a component or element of a product of the invention. An example of such a product is an inhaler as described above, having a plastic body into which memory circuitry can be embedded or moulded. The information initially programmed into the device can include details of the inhalant or liquid with which the device is loaded, the date of such loading, and a projected date by which either or all its contents should have been consumed, or if not consumed, should be discarded, as basic manufacturing data. Additional data can be entered subsequently, as described above. When the contents have been used, the product can be returned to the manufacturer to be re-filled. At that time, the memory can be fully read, and then cleared for re-programming when loaded with a fresh charge.

In accordance with the invention a wide variety of information may be programmed into an electronic memory in a manufactured product, packaging or product label. For marketing and research purposes, point of sale data can be valuable as can be details of the eventual purchaser or user. The reason or reasons for the acquisition of a product can also be of value. While this may be a little difficult to obtain for general retail products, for pharmaceutical products provision can certainly be made for the doctor or pharmacist to enter into the memory some details at least of the symptoms to be treated.

Memory circuitry can, according to the invention be easily applied to products, either physically attached by some conventional mechanism, or implanted in the body of a product or component thereof. Electronic and indeed magnetic circuitry can be easily embedded in plastics materials, while

still being programmable with additional data, and accessible to reveal the data it holds. Thus, products formed predominantly in plastics materials can be designed and manufactured with devices of the invention as integral components. Other products can easily be adapted to receive such devices, either in a separate housing or compartment, or as an attachment. Where required, mechanisms can be incorporated in products to automatically record usage. For example, a treatment device such as a piezoelectric switch or proximity sensor, can be incorporated in many types of dispensers to keep a record of when and what dosage of a prescribed treatment was taken. Thus, it is not necessary to rely on a product user to create and enter data relating to the eventual use of the product. It can be entered automatically.

The invention also relates to a method of manufacturing a utilitarian device of the kind described above. In such a method, circuitry including the electronic memory is located in a mould cavity, and a plastics element injection moulded therein around the circuitry. The plastics element is then incorporated in the device housing, although it will be appreciated that in some circumstances the plastics element can constitute the entire housing, both in effect being simultaneously injection moulded in the same cavity. The electronic circuitry is typically printed on a normally flexible substrate, which can be readily suspended in a cavity in which plastics material can be injection moulded. Other elements described above, batteries, disclosure (display) devices and connections for external electrical contacts can also be readily incorporated in the injection moulding process.

The invention will now be described by way of example and with reference to the accompanying drawings wherein:

Figure 1 is a cross-sectional view of an inhaler mounted on a stand;

Figure 2 is an end view of the assembly of Figure 1; and

Figure 3 is a schematic representation of the electronic elements and circuitry in the inhaler and stand of Figures 1 and 2.

The inhaler shown in Figure 1 comprises a main body 2 and a mouthpiece 4. It is operated in the usual way by depression of a plunger 6 or suction to discharge a suspension of inhalant and carrier through the mouthpiece. The housing is moulded in a plastics material such as polypropylene or ABS, and in a panel such as panel 8 of the housing circuitry including an electronic memory is embedded. The circuitry is coupled to a battery 10, also embedded in the inhaler housing 2 with an induction generator 12 for charging the battery. A typical magnetic induction generator unit is based on omnidirectional magnetic coils and is relatively cheap to produce. The electronic circuit and memory are based on application specific integrated circuits (ASICs) which are also inexpensive components. These elements of the inhaler are not shown in the drawing. They can all be embedded in the front panel 8, and as a consequence not be visible.

The induction generator will generate power during normal handling of the inhaler by virtue of its general movement and deliberate shaking prior to use. With this in mind, the generator is normally oriented to form movement substantially parallel to the line of action of the plunger 6, as this will be the way in which the inhaler will be shaken naturally during everyday use.

The inhaler may itself be a modular construction, with the housing 2, the mouthpiece 4 and the front panel 8 being separate components. The housing 2, for holding the plunger or canister 6, and the mouthpiece 4 may be disposable items, with the front panel 8 containing the electronic hardware, being retained for multiple use.

On either side of the front panel, there is a display unit. The unit 14 in the illustrated embodiment provides a simple indication of the quantity of inhalant retained in the housing. The unit 16 provides rather more

sophisticated information relating to the use to which the inhaler has been put. Of course, both units will only display information provided to them from the electronic memory and which the memory is programmed to display but typically, the unit 16 will indicate when a dose was last taken, and when the next dose should be taken. It can also normally show the amount of power remaining in the circuitry. Each display unit typically comprises an electroluminescent system.

The stand 18 has a recess formed to complement the base of the inhaler, with an infrared (IR) or radio frequency (RF) window 20 which, when the inhaler is installed on the stand, in juxtaposition to a corresponding window 22 at the base of the panel 8 of the inhaler. The stand itself will be connected to external equipment such as a PC which, through the windows 20, 22, can receive information from the electronic memory in the inhaler itself, and similarly program the circuitry to follow a new routine. Data may thus be transmitted, to or from the electronic circuitry. Such windows can also be used to deliver either some initial power to the circuitry, or to charge or secure that sufficient charge has been applied to the circuitry to sustain its performance over a predetermined period. This enables an inhaler to be used on a number of occasions with refills of inhalant, but it may be preferable to merely re-use the electronic circuitry in the panel 8, and regard the housing 2 (and canister or plunger 6) and the mouthpiece 4 as disposable items.

In order to monitor use of the inhaler illustrated, some mechanism must be provided for sensing the passage of inhalant through the mouthpiece. This can be accomplished by a number of means, and a variety of pressure sensors are available which can be effectively used. However, we prefer to use cross-wires in the mouthpiece which will sense not only the passage of suspended inhalant and carrier, but also the quality of the suspension; ie, the relative amounts of inhalant and carrier in the suspension. All this information

sensed by the cross-wires will be transmitted to the circuitry, and recorded in the memory.

The battery or power source for sustaining the memory and operating an electroluminescent display system, may take the form of a capacitor and we have found a 1F capacitor to be sufficient for this purpose. Such capacitor can provide the required peak energy of around 5V at 2.5mA continuously for 1.5 hours. On the basis of "short event use" such capacitor can provide enough power to operate the circuitry and an electroluminescent display unit without charge for a period of three to four days. Inhalers are normally used and carried around on a daily basis, and such normal movements will of course activate the induction generator to charge the battery. The system described does provide for long term operation.

As an alternative to coupling the electronic circuitry in the panel 8 to the stand 18, through an IR or RF window, physical connectors may be used.

Figures 3 and 4 show the basic circuitry in an inhaler and stand of the kind shown in Figure 1 formed with complementary I/R windows. An EEProm memory 24 is coupled to a driver 26 in the dose counter 28. The counter 28 includes a microcontroller which receives information from a dose detection circuit 30 activated by a sensor 32 which monitors actual use of the inhaler and/or responds directly to the operation of a switch 34 by the user taking a dose. The counter 28 is powered by the battery 10 sustained by the induction generator 12. An IR driver 36 is disposed at a surface of the body 2 to form a window (22) through which to communicate with complementary circuitry 38 in the stand. The driver 36 includes both a transmitter 40 and a receiver 42.

The circuitry 38 comprises a microprocessor 44 for translating between RS232 signalling for communicating with a remote PC and IR signalling for communicating with the dose counter 28. The microprocessor therefore includes an RS232 level converter 46 with an external connection to a PC 48,

and an IR driver 50 with an IR receiver 52 and an IR transmitter 54 which, when the inhaler is located in the stand, are in respective juxtaposition to the transmitter 40 and receiver 42 of the dose counter.

An EEProm memory can register and store data at different interface levels. For an inhaler or medical dosage container, three different interfaces are recommended; production, distribution and usage. Production data is entered once, and becomes a permanent record in the memory. It will normally only be retrieved or erased is the memory is completely reset, for example when the device is returned to the manufacturer for re-use. Distribution data is entered at subsequent stages, and this can include user instructions from a prescribing medical professional or a pharmacy for an OTC product. This data too will normally only be erased when the memory is completely reset, and be retrievable with the production data upon recycling. Usage data is of course entered, either actively or passively, by the eventual user. Some of this data can be available to the user with the user instructions, but it will all be recorded for retrieval upon subsequent recycling of the device. In this way a device of the invention can in effect carry its entire history and provide invaluable data for manufacturers and medical practitioners.

The stand illustrated can be provided with the inhaler for the user to recharge the battery and/or monitor his or her use of the device by connecting the unit to a PC. The manufacturer will of course have multiple stands for initial charging and programming, and for handling recycled units.

While the invention has been particularly described with reference to an inhaler, it should be understood that it has application to many other products. Many medicines and medical products are of course particularly sensitive to incorrect storage, age and misuse and any dispenser of such products can usefully embody the invention. Additionally though, devices of

this invention can be used with comestible, packaged and manufactured products as referred to generally above.

CLAIMS

1. A utilitarian device comprising a body having incorporated therein electronic circuitry and a power storage component therefor, the circuitry including an electronic memory; and means for adding information to the memory as the device is used.

2. A device according to Claim 1 including a mechanism for generating an electrical signal for transmission to the memory in response to use of the device.

3. A device according to Claim 2 wherein the mechanism is one of a piezoelectric device, a microswitch and a proximity detector.

4. A device according to any preceding Claim including an induction generator for sustaining the power storage component.

5. A device according to any preceding Claim including electrical contacts at a surface of the device and connected to the electronic circuitry, for coupling the circuitry to external equipment.

6. A device according to any of Claims 1 to 4 including an infra-red or radio frequency window for linking the circuitry to external equipment.

7. A device according to Claim 5 or Claim 6 in combination with a docking station for receiving the device, the docking station being operative to transfer data to and receive data from the device.

8. A device according to any preceding Claim including disclosure means for making information available from the electronic memory.

9. A device according to Claim 6 wherein the disclosure means comprises a display visible at a surface of the body.

10. A device according to Claim 9 wherein the display comprises an electroluminescent material disposed behind a window in a wall of the body.

11. A device according to any of Claims 8 to 10 including a switch for activating the disclosure means.

12. A device according to any preceding Claim containing a supply of medical treatment dosages.

13. A device according to Claim 12 wherein the circuitry is programmed to monitor the removal of dosages from the supply.

14, A device according to Claim 12 or Claim 13 wherein the circuitry is programmed to control the removal of dosages from the supply.

15. A device according to any preceding Claim wherein a plastics element is injection moulded around the electronic circuitry.

16. A device according to any preceding Claim wherein the electronic circuitry is printed on a substrate.

17. A device according to any preceding Claim including means for coupling the power storage component to an external source of power for charging.

18. A device according to any preceding Claim including a visual display coupled to the electronic circuitry for showing information.

19. A device according to Claim 18 including a switch for activating the display.

20. A device according to Claim 18 or Claim 19 wherein the display comprises an electroluminescent material disposed behind a window in a wall of the body.

21. An inhaler comprising a device according to any preceding Claim, with a mouthpiece for the withdrawal of inhalant from the container, the mouthpiece being fitted with a sensor for generating a signal in response to the passage of inhalant therethrough, and transmitting such signal to the memory.

22. An inhaler according to Claim 21 wherein the sensor comprises cross-wires traversing the mouthpiece cross-section.

23. A method of manufacturing a utilitarian device according to any preceding Claim, comprising locating circuitry including the electronic memory in a mould cavity; injection moulding a plastics element in the cavity and around the circuitry; and incorporating the plastics element in the body of the device.

24. A method according to Claim 23 wherein the body includes the plastics element, and both are injection moulded simultaneously in the same mould cavity.

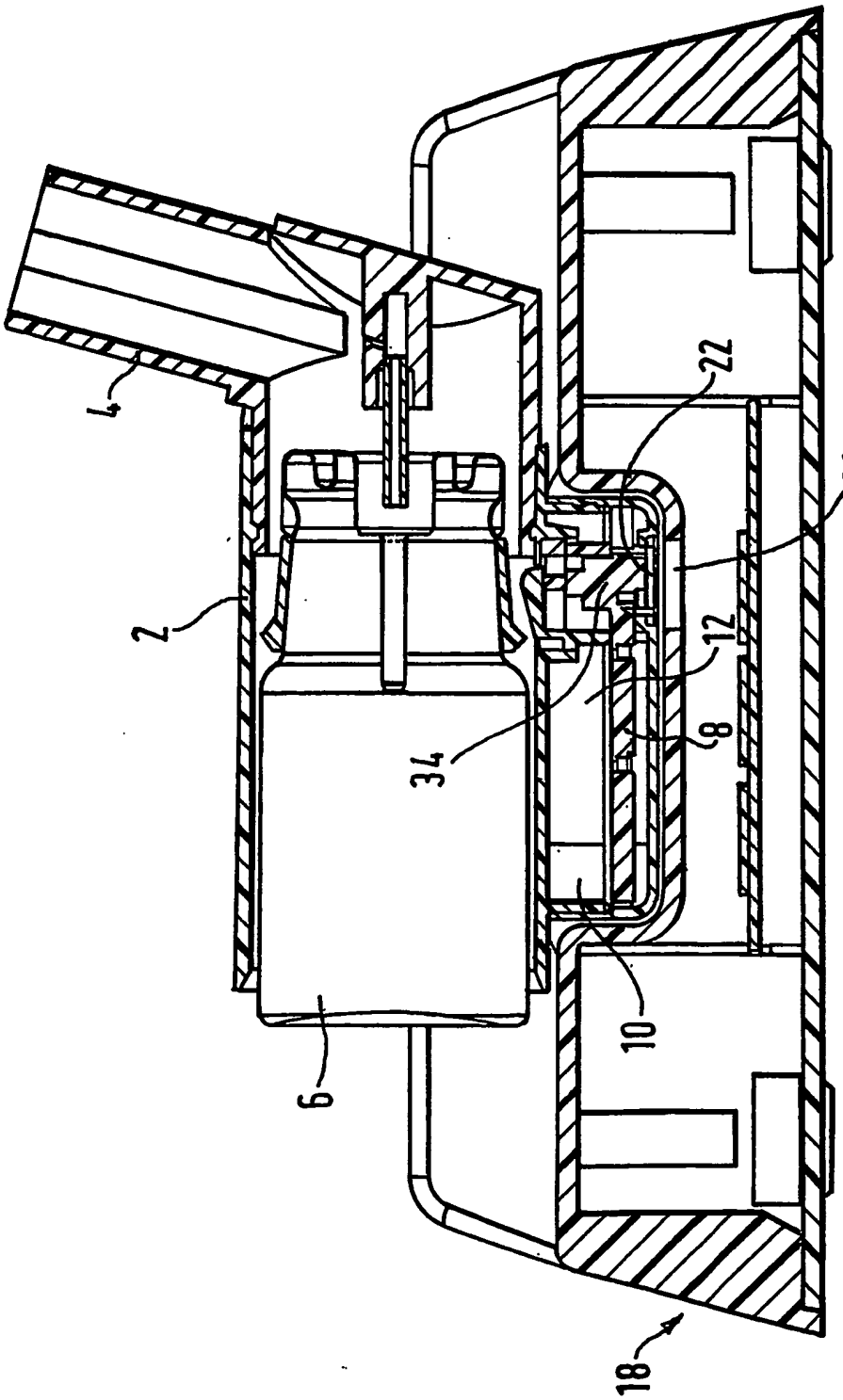

FIG.1.

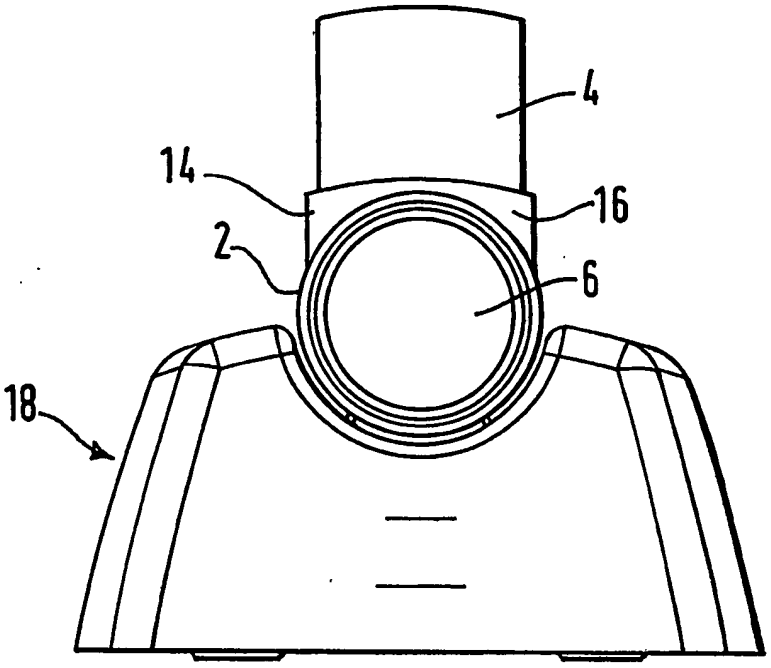
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FIG.2.

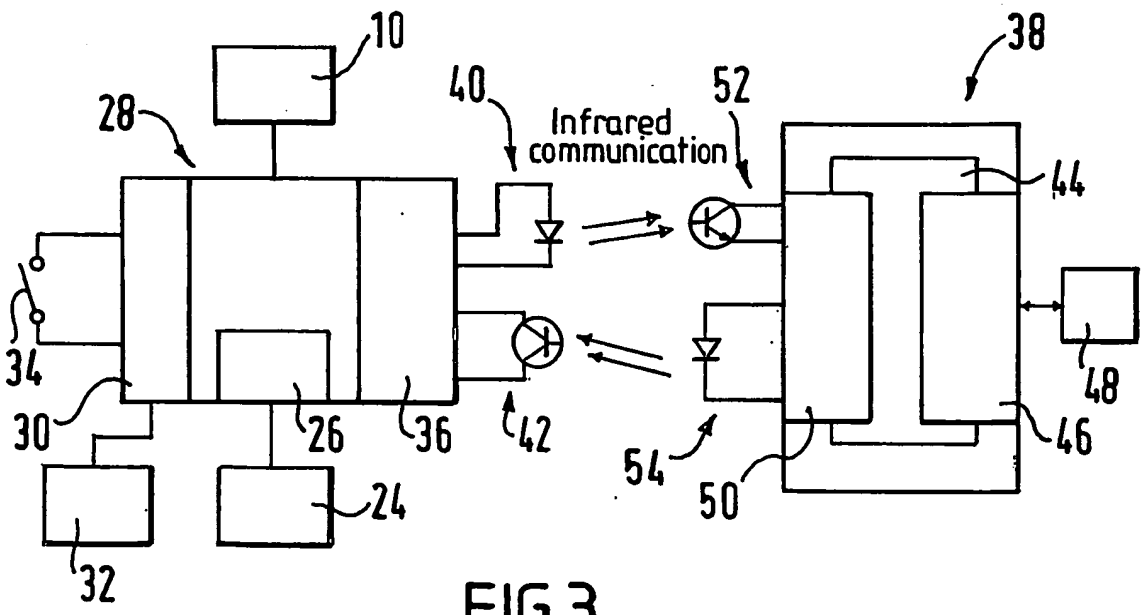
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FIG.3.

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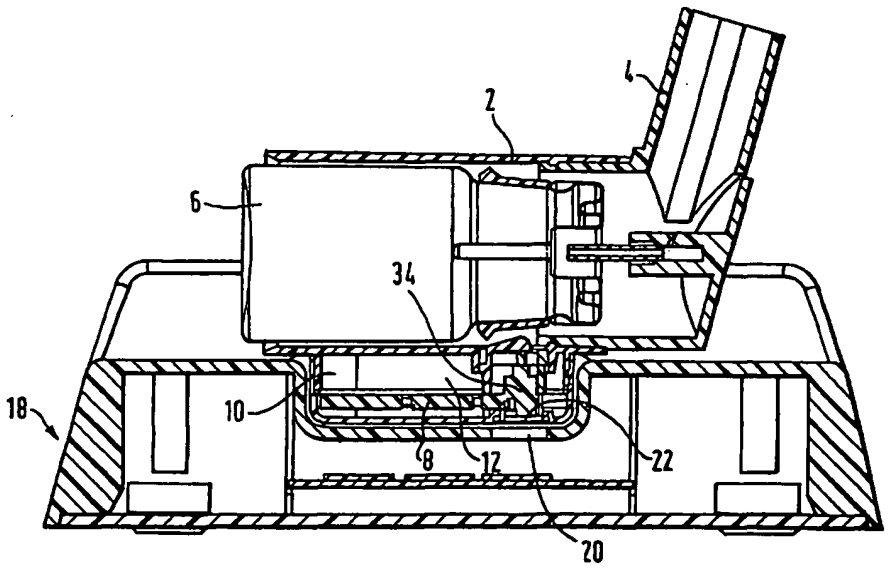
(54) Title: INHALER



(57) Abstract: A utilitarian device is disclosed comprising a body (2) in which are incorporated electronic circuitry and a power storage component (10) therefor. The circuitry includes an electronic memory (24), and provision is made for adding information to that memory (24) as the device is used. An induction generator (12) can also be incorporated in the body (2) to sustain the power storage component (10). Information can be added to the memory (10) at any stage from manufacture of the device to and during its ultimate use, thereby creating an effective history of the device in the memory (24). A particular embodiment of the invention is an inhaler in which the ultimate user can keep an effective record of activity.

WO 03/020349 A3

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

PCT/GB 02/03959

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61M15/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 284 133 A (BURNS JAMES S ET AL) 8 February 1994 (1994-02-08)	1-3, 12-16, 23,24
Y	column 7, line 51 -column 8, line 56; figure 2 column 9, line 33 -column 10, line 27; figures 3,4A	17
X	WO 95 22365 A (MARNFELDT NILS GOERAN ;WALDECK JOHAN MATS BERTIL (SE); ASTRA AB (S) 24 August 1995 (1995-08-24) page 8, line 6 - line 26; figure 2	1,4

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
3 February 2003	17. 02. 2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Zeinstra, H

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Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 809 997 A (WOLF JAMES L) 22 September 1998 (1998-09-22) column 7, line 66 -column 8, line 10; figure 1 column 14, line 32 - line 60; figure 10 column 21, line 66 -column 22, line 53; figure 20	1,5-7, 9-11
Y	US 6 076 520 A (COOPER EMILY L) 20 June 2000 (2000-06-20) column 5, line 4 - line 12; figure 6 column 6, line 54 - line 62	17

INTERNATIONAL SEARCH REPORT

PCT/GB 02/03959

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

As a result of the prior review under R. 40.2(e) PCT, no additional fees are to be refunded.

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☒ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

1-3,4,5-7,9,10,11,12-14,15,16,17,23,24

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☒ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-3,12-16,23,24

1.1. Claims: 1-3
The device according to claim 1 in combination with a mechanism for generating an electrical signal.

1.2. Claims: 1,12-14
The device according to claim 1 in combination with a supply of medical treatment dosages.

1.3. Claims: 1,15,23,24
The device according to claim 1 in combination with am injection moulded plastic elements

1.4. Claims: 1,16
The device according to claim 1 in combination with a printed electronic circuit.

2. Claims: 1,4,17

The device according to claim 1 in combination with sustaining, charging the power storage component.

3. Claims: 1,5-7,9,10,11

The device according to claim 1 in combination with coupling, linking the circuitry to external equipment.

4. Claims: 1,8,11,18-20

The device according to claim 1 in combination with making information available, showing information.

5. Claims: 21,22

Inhaler comprising the device of claim 1 and an inhalant sensor.

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

INTERNATIONAL SEARCH REPORT

PCT/GB 02/03959

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5284133 A	08-02-1994	NONE	
WO 9522365 A	24-08-1995	AU 1865095 A	04-09-1995
		WO 9522365 A1	24-08-1995
		ZA 9501238 A	21-08-1995
US 5809997 A	22-09-1998	US 6148815 A	21-11-2000
		WO 9713553 A1	17-04-1997
US 6076520 A	20-06-2000	AU 7482698 A	08-12-1998
		GB 2340406 A	23-02-2000
		WO 9851361 A2	19-11-1998